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Dissociative absorption, mind-wandering, and attention-deficit symptoms: Associations with obsessive-compulsive symptoms

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Objective. Dissociative absorption is a tendency to become absorbed in imagination or in an external stimulus (movie, book) to the point of obliviousness to one's surroundings and reduced self-awareness. It has been hypothesized to play a role in the maintenance of obsessive-compulsive (OC) symptoms. However, because absorption is a trait of reduced attentional control, a possible confound may be attention-deficit/hyperactivity (ADHD) symptoms, which have been reported to be comorbid with obsessive-compulsive disorder (OCD). This study aimed to validate dissociative absorption as unique from ADHD symptoms as well as from mind-wandering and to show that it has incremental predictive value over these constructs in predicting OC symptoms.

Design. Cross-sectional.

Method. Three-hundred and three undergraduate students completed online questionnaires, which were analysed using exploratory and confirmatory factor analyses.

Results. As hypothesized, dissociative absorption emerged as a unique construct, separate from ADHD, and mind-wandering (whereas the latter two were not completely separate from each other). Additionally, absorption was uniquely associated with OC symptoms, with a moderate-to-strong effect size, demonstrating incremental predictive value over the other constructs.

Conclusions. Attentional deficits and mind-wandering cannot account for the association between absorption and OC symptoms. Future research should explore whether reports of comorbidity between ADHD and OC symptoms may be inflated due to misdiagnosis of absorption tendencies as ADHD.

Practitioner points

- Dissociative absorption is a personality tendency that may interact with obsessive-compulsive symptoms, and thus, it may deserve clinical attention when treating obsessive-compulsive disorder (OCD)
- Dissociative absorption might bring about an unnecessary diagnosis of attention-deficit hyperactivity disorder (ADHD) in individuals with obsessive-compulsive symptoms, and thus, it should be screened for.

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- This study was based on a non-clinical sample; future studies should replicate the findings among samples with an OCD diagnosis.
- This study is based on self-report questionnaires; future studies should use clinician interviews.

Dissociative 'absorption and imaginative involvement' is a tendency for one's awareness to become absorbed in an internal or external stimulus to the point of obliviousness to one's surroundings (Carlson & Putnam, 1993). Often the stimulus will be one's imagination, experienced by absorbers as vivid and engaging, and this may engender confusion with reality; absorbers may find themselves unsure of what they have done or said because their attention had been totally immersed in something else. Indeed, absorption is considered to represent a temporary separation of mental processes that are normally integrated (Butler, 2004). Although absorbers may often function with a sense of spontaneity and reduced self-reflection, they typically only realize this in retrospect (Butler, 2006). The absorption construct has been empirically derived in several factor analyses from the most widely used questionnaire assessing dissociation (the Dissociative Experiences Scale, DES; Carlson & Putnam, 1993). Because of the trait's commonness compared to other subscales, it carries most of the variance of the DES, especially in non-clinical samples (Soffer-Dudek, Lassri, Soffer-Dudek, & Shahar, 2015; Stockdale, Gridley, Balogh, & Holtgraves, 2002).

The commonness of absorption has rendered it somewhat controversial. Some have claimed that it is merely a tendency for an alteration in consciousness that does not represent dissociation (e.g., van der Hart, Nijenhuis, Steele, & Brown, 2004), but others disagree (Dalenberg *et al.*, 2012). It fits the notion of dissociation, because consciousness or awareness becomes focused only on a fragment of experience while excluding the rest (Butler, 2006). The tendency of an individual to function as a collection of independent, non-integrated neurocognitive subsystems is normal in certain situations, such as driving while listening to the radio (Sasai, Boly, Mensen, & Tononi, 2016). It seems that some individuals are prone to do this more than others; one study found reduced resting-state global functional connectivity among high absorbers, suggesting less synchronized brain activity than low absorbers (Soffer-Dudek, Todder, Shelef, Deutsch, & Gordon, 2018). Reduced connectivity as a neural correlate of dissociation has been demonstrated in clinical samples as well (Bob, Susta, Glaslova, & Boutros, 2010; Farina *et al.*, 2014; Hopper *et al.*, 2002; but see: Bob & Svetlak, 2011), supporting the idea that absorption may represent the common end of a dissociative continuum.

Importantly, many researchers assert that absorption is a normal personality trait and refer to it as non-pathological dissociation (e.g., Waller & Ross, 1997). However, many psychopathologies stem from normal or common experiences that have become abnormal in their intensity (e.g., apprehension, sadness), so the commonness of an experience alone does not necessarily attest to its linear association with psychopathology. Moreover, personality traits often represent risk factors for psychopathology. Indeed, high absorption is correlated with psychopathological symptoms and distress, depression, anxiety, and psychoticism (Levin & Spei, 2004; Soffer-Dudek *et al.*, 2015) as well as post-traumatic stress (Armour, Contractor, Palmieri, & Elhai, 2014).

Absorption and obsessive-compulsive symptoms

In particular, it has been proposed in a theoretical model (Soffer-Dudek, 2014) that absorption may represent a risk factor for obsessive-compulsive (OC) symptoms, possibly playing a role in their cause and maintenance. This proposition is based on the idea that

the narrow attentional spotlight and dissociated behaviour characterizing absorbers are not continuous; every once in a while, their awareness returns to an integrated state (Butler, 2006), whereupon they may wonder what just transpired, even regarding their own actions. This uncertainty was hypothesized to cause anxiety, obsessing, and checking in an attempt to substantiate reality (Soffer-Dudek, 2014). O'Connor and Aardema (2012) have conceptualized the nature of consciousness during obsessional thought as immersive and dissociative, almost as if 'in a bubble'; accordingly, it may also be hypothesized that OC symptoms bring about absorptive states or that obsessions and absorption enhance each other reciprocally. In addition, absorption in vivid daydreaming and engagement in fantasy are associated with proneness for experiencing hallucinations (Glicksohn & Barrett, 2003), perhaps pointing to blurred boundaries between reality and imagination. Thus, dissociation and OC symptoms may be related due to dysfunctional reality monitoring or reduced confidence in reality (Merckelbach & Wessel, 2000).

In accordance with these ideas, absorption and OC symptoms were strongly related, and this relation demonstrated bidirectional specificity; it was shown to be significantly stronger than: (1) relationships of other dissociative aspects with OC symptoms and (2) relationships of absorption with other symptoms (Soffer-Dudek *et al.*, 2015). Moreover, although causality cannot be ascertained in non-experimental designs, that study went beyond relying solely on cross-sectional associations and demonstrated directionality using a prospective-longitudinal design: Absorption predicted a longitudinal increase, across 3 months, in OC symptoms, supporting the notion that absorption may perhaps enhance these symptoms or interact in some way with their maintenance. Another study relying on temporal assessments treated these constructs as state measures in a daily diary design, showing that absorption on 1 day predicted OC symptoms on the next, whereas the opposite effect was not found (Soffer-Dudek, 2017). Such a design does not elucidate whether absorption was present before OC symptom onset, and as such, it also does not establish the direction of causality. Nevertheless, absorption at baseline predicts non-responsiveness to treatment among obsessive-compulsive disorder (OCD) patients (Rufer *et al.*, 2006). Thus, it may be useful to better understand the nature of the absorption-OC relationship.

Inferential confusion – a reliance on imagination and a distrust of the senses – is strongly related to OCD (O'Connor & Robillard, 1995) and is reminiscent of absorption. Indeed, dissociation and absorption, OC symptoms, and inferential confusion are interrelated (Aardema & Wu, 2011; Paradisis, Aardema, & Wu, 2015). Nevertheless, whereas inferential confusion is considered a cognitive reasoning tendency to draw inferences on the basis of unlikely possibilities (O'Connor & Aardema, 2012), absorption is presumed to be an automatic state, in which attention is narrowed, without volition or meta-conscious self-awareness (Butler, 2006). Perhaps those who tend frequently to experience absorption are less efficient at regulating their attention; this would be compatible with the finding that absorbers seem to have a poorer ability to regulate consciousness states in the form of sleep–wake transitions (Soffer-Dudek *et al.*, 2017).

Absorption and inattention

The strong relationship between absorption, which seems to involve regulation of attention, and OC symptoms, is reminiscent of a reported comorbidity between OCD and attention-deficit hyperactivity disorder (ADHD). For example, a large national survey in the United States found that 18.8% of cases with OCD also had ADHD, and for all cases, the

ADHD symptoms started earlier than the OCD symptoms (Ruscio, Stein, Chiu, & Kessler, 2010). Moreover, impairments in executive functions (e.g., response inhibition) and sustained attention are characteristic of both ADHD (Lipszyc & Schachar, 2010; Pievsky & McGrath, 2018) and OCD (Abramovitch, Abramowitz, & Mittelman, 2013; Lipszyc & Schachar, 2010; Shin, Lee, Kim, & Kwon, 2014). Notably, however, recent studies have claimed that comorbidity reports are inconsistent, especially in adults (Abramovitch, Dar, Mittelman, & Wilhelm, 2015). In addition, these two disorders are characterized by different structural and functional brain abnormalities (Norman *et al.*, 2016), mostly specific (rather than shared) genetic influences (Pinto *et al.*, 2016), and different phenomenological presentations (Abramovitch *et al.*, 2015). The aetiological mechanisms behind OCD and ADHD also seem to differ; whereas the former is associated with thoughts related to danger and threat, the latter is inherently inattentive regardless of a specific content. Thus, it has been questioned whether the 'inattention, distractibility and restlessness' in comorbid individuals represents internal distraction from obsessional ideation or anxiety or rather, 'true' ADHD (Geller *et al.*, 2004, p. 83). Some (e.g., Geller *et al.*, 2004; Masi *et al.*, 2006; Ruscio *et al.*, 2010) have maintained that the OCD-ADHD comorbidity represents a genuine dual-diagnosis reality, yet others have debated this, contending that OCD manifests in ADHD-like symptoms that do not represent the true disorder (Abramovitch, Dar, Mittelman, & Schweiger, 2013; Abramovitch *et al.*, 2015; Guzick *et al.*, 2017). Thus, it remains to be determined whether the deficient attentional capacities characterizing people with OCD (Abramovitch, Abramowitz, *et al.*, 2013; Shin *et al.*, 2014) reflect (and stem from) the subjectively reported difficulty in controlling and regulating obsessional thoughts, or rather, if they may pose a risk factor for the development of OCD. Indeed, impaired executive functioning abilities are a hindrance to emotion regulation in general, and ADHD is related to a host of psychopathological symptoms (Stanton & Watson, 2016; Steinberg & Drabick, 2015).

In a related vein of research, mind-wandering, the tendency to be easily distracted or delve into daydreaming instead of focusing on relevant tasks, is also predictive of dysphoria, stress, and decreased happiness and well-being (Killingsworth & Gilbert, 2010; Mrazek, Phillips, Franklin, Broadway, & Schooler, 2013; Smallwood, O'Connor, Sudbery, & Obonsawin, 2007). These associations raise the question of whether absorption has any specific role in OC symptoms, over and above that of attentional control or general 'absent-mindedness'. Moreover, the concept of dissociative absorption is highly reminiscent of the construal of mind-wandering as a *decoupling* of attention from external perception, whereby mental activity is focused on internally generated thought (Baird, Smallwood, Lutz, & Schooler, 2014; Smallwood, 2013; Smallwood & Schooler, 2015). Importantly, however, although absorption is inherently linked with daydreaming, it may also manifest in immersion in an external stimulus (e.g., a movie or a book). The intensity of focus, to the point of obliviousness to other stimuli, rather than the nature of the stimulus (internal/external), is at the crux of the definition of absorption. Moreover, even if the stimulus engaging the individual is internal (daydreaming), the tendency to remain in the absorbed (or decoupled) state, despite potential distractions, may possibly be the defining feature of this trait. However, this elucidation underscoring the *continuity* of the process rather than its initial *occurrence* has also been discussed regarding mind-wandering (Smallwood, 2013). Thus, the similarity in definitions raises the question of whether these are disparate constructs.

Similarly, one might deliberate whether absorption is a validated, well-differentiated construct compared to attention-deficit symptoms. Indeed, dissociative experiences have

been shown to be related to ADHD symptoms in child and adult clinical samples (e.g., Cromer, Stevens, DePrince, & Pears, 2006; Kaplow, Hall, Koenen, Dodge, & Amaya-Jackson, 2008; Matsumoto & Imamura, 2007; Özdemir, Boysan, Güzel Özdemir, & Yilmaz, 2015). Additionally, high dissociators exhibited deficiencies in sustaining attention and in inhibitory functions in several studies (e.g., Dorahy, McCusker, Loewenstein, Colbert, & Mulholland, 2006; Elzinga, de Beurs, Sergeant, Van Dyck, & Phaf, 2000; Giesbrecht, Merckelbach, Geraerts, & Smeets, 2004; Guralnik, Schmeidler, & Simeon, 2000). Furthermore, one study on the validity of the Czech adolescent version of the DES found scores to be predictive of an ADHD diagnosis but not of a dissociative diagnosis (Soukup, Papežová, Kuběna, & Mikolajová, 2010). Interestingly, a recent biological model mapping individual differences in executive functions showed that durable representations in the pre-frontal cortex (e.g., a strong image) are associated with weaker pre-frontal-posterior connectivity, resulting in impaired flexibility in shifting attention and impaired inhibition (Herd *et al.*, 2014). This may explain why a tendency for vivid imagination results in decreased integrative functioning (i.e., dissociation) and deficient control over one's attentional spotlight. It is therefore important to establish empirically that self-report measures of dissociative absorption assess a different construct than attention-deficit measures.

The present study

Poor attentional capacities (e.g., mind-wandering, difficulty in sustaining attention) may be a confound or common factor inflating the OC-absorption association. Indeed, certain behavioural manifestations, such as acting without paying full attention or losing track of where you are, are probably shared, whether they stem from dissociative absorption, mind-wandering, or inherent attention-deficits. However, theoretically, absorption is not identical to attention-deficit. For example, high absorbers may possibly function well during a boring, repetitive task, even if they tend to dissociate or daydream while doing so (rather than focus their awareness on the task). In such a situation, noise in the background may be distracting to someone with inherent inattention, whereas conversely, high absorbers may be less affected. Indeed, high dissociation scores predicted unique variance in P300 amplitudes, suggesting better ability to ignore distracting information (Kimble, Fleming, & Bandy, 2010). According to Butler (2006), absorption and attention differ in intensity of focus, awareness and self-reflection, accessibility of surroundings (social or personal context), the experience of voluntary control, and the phenomenology of observing versus complete engagement. To conclude, absorption and inattention, or the tendency to mind-wander, are probably positively related – but distinguishable – constructs.

To establish the significance of dissociative absorption as a characteristic of individuals with OC symptoms, it is necessary to explore (1) the uniqueness of absorption as a separate construct, encompassing the tendency to dissociate and narrow one's experience rather than merely the tendency to be distracted or engage with internally generated information; and (2) the ability of dissociative absorption to uniquely explain the variance of OC symptoms over and above the predictive ability of attentional measures. Accordingly, these were the two aims of this study. The study hypotheses were (1) that dissociative absorption would represent a separate factor from the measures of attention-deficit and mind-wandering and (2) that it would have incremental predictive value over those constructs regarding OC symptomatology.

Material and method

Participants and procedure

Participants were 303 Israeli undergraduate students (74.3% females; age $M = 23.5$, $SD = 1.4$, range 18–28), who enrolled for a study on 'Dissociation, attention, risk, and resilience' through the institutional experiments system. The study included online completion of questionnaires on psychopathology, sleep and dreaming, and attention and daydreaming tendencies (order was counter-balanced). Participants provided informed consent electronically. Ethical considerations of this study were approved by the institutional review board. Initially, 314 students enrolled, but 11 were eventually excluded because most of their data were missing ($n = 7$) or because the time it took them to complete all questionnaires was under 15 min, thus questioning the validity of their responses ($n = 4$). Most ($n = 215$) participated in exchange for course credit, whereas $n = 88$ received monetary reimbursement ($15). The groups were indistinguishable on all continuous variables used in this study and on gender (using *t*-tests and chi-square test, respectively).

The sample was characterized by good to excellent fluency in Hebrew (100%). Most of the participants (96%) were single (3% married, 1% unknown). Socio-economic status was mostly middle and middle-upper class. Demographics also included the question: 'Have you ever sought mental health counselling?', for which 46% answered affirmatively. Participants were also questioned whether they had ever received an attention-deficit diagnosis; 16% ($n = 48$) answered affirmatively.

Measures

Dissociation

Dissociative experiences were assessed using the revised DES (Carlson & Putnam, 1993), a widely used self-report questionnaire intended for clinical and non-clinical samples. Respondents are asked to estimate the percentage of time they experience 28 dissociative phenomena on an 11-point scale (0%, 10%, 20%, etc.). For this study, the 'pure absorption' scale (Soffer-Dudek *et al.*, 2015) was used, relying on 8 DES items (14, 15, 17, 18, 20, 21, 23, and 24). The scale is superior to previous empirically derived DES absorption factors both theoretically (does not include items that represent other types of dissociation) and statistically (does not include items that are highly loaded on other dissociative factors). Cronbach's alpha for pure absorption in this study was .87.

Attention-Deficit/Hyperactivity Disorder (ADHD)

The Attention-Deficit/Hyperactivity Disorder Self-Report Screening Scale (ASRS) Symptom Checklist is a widely used 18-item scale developed by the World Health Organization as a reliable and valid self-report measure of adult ADHD symptoms, predictive of clinical diagnoses (Adler *et al.*, 2006; Kessler *et al.*, 2005). Each ADHD symptom is rated on a 5-point scale (0 = never, 4 = very often). All ASRS items are compatible with ADHD criteria according to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5, American Psychiatric Association, 2013), which did not alter the 18 symptoms from the previous manual, but merely eased criteria for diagnosis by lowering the threshold. Thus, the 18-item version remains a valid assessment tool for ADHD in the context of DSM-5, especially when used as a continuous score measure rather than a screening measure. In this study, Cronbach's alpha for the 18 items was .89.

Mind-Wandering

The Mind-Wandering questionnaire (MWQ; Mrazek *et al.*, 2013), a self-report measure for the assessment of task-unrelated thought, comprises five items, rated on a 6-point scale (1 = almost never, 6 = almost always). The authors have shown the homogeneity of this construct as a single factor and its validity in relation to a computerized thought-sampling task. In this study, Cronbach's alpha was .88.

Obsessive-compulsive symptoms

Obsessive-compulsive symptomatology was assessed using the Obsessive-Compulsive Inventory – Revised (OCI-R; Foa *et al.*, 2002), a widely used, well-validated self-report scale. It consists of 18 statements requiring respondents to rate how much the experience of washing, checking, ordering, obsessing, hoarding, or neutralizing has distressed or bothered them in the past month, on a 5-point scale (0 = not at all, 4 = extremely). In this study, Cronbach's alpha for the total score was .92.

Analytic strategy

Missing data were negligible in this study (ranging from 0% to 1.00% for all items), and therefore, missing data completion strategies were not employed.

First, an exploratory factor analysis (EFA) was conducted, including the items of the ASRS, the MWQ, and the pure absorption scale, with the aim of testing whether attention-deficit and mind-wandering items will load on separate factors than absorption items. Although these are validated questionnaires and theoretically they should load on separate factors, using exploratory (rather than confirmatory) analyses allowed for, and examined, the possibility that the items will empirically load on mixed factors due to content overlap. The number of factors was not constrained in advance to explore the covariances in the data assuming no *a priori* hypothesis. Principal axis factoring with oblique rotation (oblimin) allowed the factors to correlate; the pattern matrix was interpreted.

Next, the factors that emerged from the EFA were used in a confirmatory factor analysis (CFA) on the same sample using structural equation modelling (SEM) in AMOS Graphics software (version 21) based on the maximum-likelihood iteration procedure. OC symptoms were added as a manifest variable based on the OCI-R total score. The purpose of this analysis was to explore the relations of the resultant factors to OC symptoms. After establishing model fit of the measurement model, the OCI-R was specified as an outcome variable in the structural model, thereby enabling the examination of unique contributions of absorption, ADHD symptoms, and mind-wandering in explaining the variance of OC symptoms.

Results

Table 1 presents descriptive statistics for all study variables.

Exploratory factor analysis

The Kaiser–Meyer–Olkin measure of sampling adequacy was excellent (KMO = 0.92), suggesting that much of the data may be explained by underlying factors, and thus, they are suitable for EFA. Bartlett's test of sphericity was highly significant (chi-square = 4305.29, $df = 465$, $p < .001$), again suggesting that the data are suitable for EFA.

Table 1. Descriptive statistics for study variables (average of each scale's total items)

	Mean	*SD*	Range
Dissociative pure absorption scale of the DES	20.94	17.25	0.00–82.50
ADHD Self-Report Screening Scale (ASRS)	1.45	0.59	0.00–3.39
Mind-Wandering Questionnaire (MWQ)	3.36	1.00	1.00–6.00
Obsessive-Compulsive Inventory – Revised (OCI-R)	0.88	0.66	0.00–3.83

Note. ADHD = attention-deficit/hyperactivity disorder; DES = Dissociative Experiences Scale; *SD* = standard deviation.

Table 2 presents the results of the EFA. As can be seen in the table, five factors emerged. Factor 1 includes all five mind-wandering items as well as two ASRS items portraying the tendency to be easily distracted or to mind-wander in daily situations. Hence, this factor was labelled 'Mind-Wandering/Distraction'. Notably, this first factor is the only one based on multiple questionnaires. Factor 2 comprises the eight items of the pure absorption scale; hence, it was labelled 'Dissociative Absorption'. Factor 3 includes four ASRS items that portray socially inadequate behaviour (e.g., 'interrupts others when they are busy'), and it was labelled 'Social Impulsivity'. Factor 4 includes seven ASRS items that tap onto difficulties in organizational skills, managing minor details thoroughly, meeting deadlines, and controlling one's concentration when working. This factor was labelled 'Attention/Organization Deficit'. Finally, Factor 5 includes five ASRS items that assess hyperactivity and restlessness. It was labelled 'Hyperactivity'.

Confirmatory factor analysis

Next, the five EFA factors were specified as latent variables in a structural equation model, and a manifest variable, OC symptoms, was added. All variables were allowed to correlate, and model fit for the measurement model was examined. Due to the large sample size, chi-square was statistically significant, but overall model fit indices were adequate, $\chi^2_{(450)} = 882.25$, $p < .001$, $\chi^2/df = 1.96$, CFI = .897, RMSEA = .056; however, because the CFI was slightly lower than .90, modification indices were explored. The suggested modification carrying the largest magnitude was a correlation between the uniqueness of ASRS item 8 (difficulty maintaining attention when doing boring and repetitive work), which was loaded on the 'Attention/Organization Deficit' factor, with the 'Mind-Wandering/Distraction' latent factor. This made sense both statistically (this item was highly loaded on this factor in the EFA) and theoretically (this item is similar in content to the factor). After adding the suggested correlation, model fit improved slightly and was adequate according to common criteria guidelines for good fit, $\chi^2_{(449)} = 853.94, p < .001$, $\chi^2/df = 1.90$, CFI = .903, RMSEA = .055.[1] Table 3 presents correlations between constructs. Importantly, the factors Mind-Wandering/Distraction and Attention/Organization Deficit were correlated with a magnitude of .70, indicating almost 50% shared variance, again suggesting that they are not entirely separate constructs. Hyperactivity was also strongly correlated with the other MWQ and ASRS factors. Other correlations were strong yet appropriate for separate constructs.

[1] *With large sample sizes, the chi-square test is statistically significant even in the face of adequate models.*

Table 2. Factor loadings (pattern matrix) from the exploratory factor analysis (EFA), for each absorption, attention-deficit, or mind-wandering item, using principal axis factoring with oblique rotation

	1. Mind-Wandering/ Distraction	2. Dissociative Absorption	3. Social Impulsivity	4. Attention/ Organization Deficit	5. Hyperactivity (reversed factor)
MWQ 5: mind-wander during lectures of presentations	**.76**		.12		
MWQ 2: need to reread text	**.74**			.10	
MWQ 4: listen with one ear, think of something else	**.72**	.10	.14	−.14	
ASRS 11: distracted by activity/noise	**.55**			.12	−**.35**
MWQ 3: do things without paying full attention	**.54**	.15		.13	
MWQ 1: difficulty focusing on simple/repetitive work	**.53**			.26	−.13
ASRS 9: difficulty concentrating when spoken to	**.30**	.15			−.29
DES 14: remembering an event vividly, as if reliving		**.72**			
DES 18: so involved in fantasy/daydream it feels real		**.72**			
DES 15: unsure whether things happened or dreamt	.10	**.71**			
DES 20: stare off into space thinking of nothing		**.70**	−.11		
DES 17: absorbed in movie, unaware of surroundings		**.69**			
DES 24: can't recall what was done or just thought of		**.66**	−.13	.11	
DES 21: talk out loud to oneself when alone	−.11	**.62**			
DES 23: at times feels amazing ease and spontaneity		**.60**			
ASRS 15: talk too much in social situations			**.69**		.11
ASRS 16: finish other people's sentences			**.61**		−.14
ASRS 18: interrupt others when they are busy			**.60**		−.11
ASRS 17: difficulty waiting for your turn			**.54**		−.13
ASRS 2: difficulty getting things organized				**.70**	
ASRS 1: trouble wrapping up details of project	.11			**.57**	
ASRS 7: make careless mistakes on boring project		.16		**.53**	−.16
ASRS 3: have problems remembering obligations	−.15		.16	**.53**	−.18

Continued

Table 2. (*Continued*)

	1. Mind-Wandering/ Distraction	2. Dissociative Absorption	3. Social Impulsivity	4. Attention/ Organization Deficit	5. Hyperactivity (reversed factor)
ASRS 8: difficulty maintaining attention during boring work	**.35**			**.45**	−.13
ASRS 4: avoid/delay task which requires thought	.24		.12	**.44**	.14
ASRS 10: often misplace or cannot find things		.18	.14	**.43**	−.10
ASRS 13: feel restless or fidgety	.14				**−.69**
ASRS 6: feel overly active, like driven by a motor		.18	.13		**−.57**
ASRS 14: difficulty unwinding and relaxing			.12		**−.53**
ASRS 12: difficulty remaining seated in meetings				.16	**−.52**
ASRS 5: fidget/squirm with hands/feet when sitting				.15	**−.51**

Notes. ASRS = Attention-Deficit/Hyperactivity Disorder Self-Report Screening Scale; DES = Dissociative Experiences Scale; MWQ = Mind-Wandering Questionnaire.
Coefficients under .10 are suppressed and those over .30 are bolded.

Next, a structural model was examined by specifying OC symptoms as an outcome (predicted) variable, with other variables as predictors in the path model (which were still allowed to correlate).[2] Model fit was unchanged. Table 4 presents the regression coefficients, that is, the unique contribution of each factor in explaining OC symptoms, after controlling for the other factors. Dissociative absorption was uniquely associated with OC symptoms with a robust and significant effect.

Two additional analyses were carried out to ensure the validity of these results. First, two pure absorption items (namely, 15 – not being sure whether things that one remembers happening really did happen, or whether one just dreamed them; and 24 – not being able to remember whether one has done something or has just thought about doing it) may be confounded with OC symptoms. To rule out the possibility that they are solely responsible for the absorption-OC relationship, these two items were omitted from the structural model, and the results were re-examined. Model fit was as good as before, $\chi^2_{(390)} = 727.32$, $p < .001$, $\chi^2/df = 1.87$, CFI = .911, RMSEA = .054, and the relation of the absorption factor with OC symptoms remained just as strong ($\beta = .37$, CI [0.24, 0.51], $p < .001$), suggesting that these items cannot account for this relationship.

Table 3. Zero-order correlations between latent factors and the manifest variable (OC symptoms) in the measurement model of the confirmatory factor analysis

	1	2	3	4	5	6
1. Mind-Wandering/Distraction	1.00					
2. Dissociative Absorption	.51	1.00				
3. Social Impulsivity	.54	.41	1.00			
4. Attention/Organization Deficit	.70	.43	.56	1.00		
5. Hyperactivity	.68	.46	.66	.67	1.00	
6. OC symptoms	.47	.54	.33	.33	.45	1.00

Notes. OC = obsessive-compulsive.
All correlations are statistically significant at the $p < .001$ level.

Table 4. Regression coefficients from the structural model of the confirmatory factor analysis, in which obsessive-compulsive symptoms are specified as the outcome variable, regressed on the five latent factors

	Standardized coefficient (β)	Bootstrapped 95% CI	*p*-value
1. Mind-Wandering/Distraction	.34	0.14, 0.50	<.001
2. Dissociative Absorption	.37	0.22, 0.52	<.001
3. Social Impulsivity	−.01	−0.21, 0.15	>.250
4. Attention/Organization Deficit	−.20	−0.38, 0.02	.030
5. Hyperactivity	.18	−0.05, 0.41	.078

Note. CI = 95% confidence intervals, which were computed by running a bootstrapped model and using the bias-corrected and accelerated method. To obtain CIs for the standardized coefficients, the model was conducted on standardized items, and variances of latent factors were constrained to 1.

[2] *Notably, the terms* predictors *and* outcome/predicted variable *denote the specification of the variables in the regression model rather than implying causality.*

Second, the non-separateness of the Mind-Wandering/Distraction factor and the Attention/Organization Deficit factor may have caused multicollinearity, weakening these two predictors and in turn conferring on absorption an advantage in effect size. To explore this, three additional models were examined: (1) a model in which the items of Mind-Wandering/Distraction and Attention/Organization Deficit were specified as one combined factor. Model fit in this case was non-optimal, $\chi^2_{(455)} = 1027.29$, $p < .001$, $\chi^2/df = 2.26$, CFI = .864, RMSEA = .065. The effect of absorption on OC remained strong ($\beta = .38$, CI [0.25, 0.52], $p < .001$), whereas the combined factor had a somewhat weak effect on OC symptoms ($\beta = .20$, CI [0.03, 0.39], $p = .021$); (2) a model in which the Mind-Wandering/Distraction factor and its items were omitted altogether. Model fit was excellent, $\chi^2_{(266)} = 456.02$, $p < .001$, $\chi^2/df = 1.71$, CFI = .930, RMSEA = .049. The effect of absorption on OC remained strong ($\beta = .43$, CI [0.27, 0.54], $p < .001$), whereas the Attention/Organization Deficit factor had no effect on OC symptoms at all ($\beta = -.05$, CI [−0.18, 0.22], ns); (3) a model in which the Attention/Organization Deficit factor and its items were omitted altogether. Model fit was again excellent, $\chi^2_{(266)} = 473.52$, $p < .001$, $\chi^2/df = 1.78$, CFI = .936, RMSEA = .051. The effect of absorption on OC remained strong ($\beta = .37$, CI [0.23, 0.51], $p < .001$), whereas the Mind-Wandering/Distraction factor had a weaker effect on OC symptoms ($\beta = .24$, CI [0.08, 0.43], $p = .003$).[3] Taken together, the results of these three models ruled out the possibility that multicollinearity between Mind-Wandering/Distraction and Attention/Organization Deficit was an alternative explanation for the findings.

Discussion

In accordance with the hypotheses, the current study demonstrated (1) the validity of the absorption construct as an entity separate from both attention-deficit symptoms and mind-wandering; conversely, attention-deficit symptoms and mind-wandering did not prove to be completely separate entities but instead, were somewhat mixed with one another; (2) the significance of the absorption construct in its unique association with OC symptoms, over and above the association between OC symptoms and self-reported attentional capacities. Thus, attention-deficit symptoms and wand-wandering cannot explain the absorption-OC relation.

Reports of comorbidity rates between OCD and ADHD contain many inconsistencies that, taken together, suggest that this comorbidity may actually be an inflated artefact (Abramovitch, Dar, *et al.*, 2013; Abramovitch *et al.*, 2015). Indeed, Abramovitch, Dar, Hermesh, and Schweiger (2012) have suggested an 'executive overload' model for OCD, according to which obsessions represent attempts to control automatic processes, consequently consuming valuable cognitive resources and resulting in neuropsychological impairments. This model, suggesting that ADHD-like symptoms are actually an epiphenomenon of OCD symptoms, is supported by the finding that treatment for OCD is related to a reduction in inattention symptoms (Guzick *et al.*, 2017). The executive overload model represents one possible explanation for the findings of the current study: Specifically, individuals characterized by OC symptoms probably score highly on absorption because they tend to immerse in obsessions or engage their full attention in

[3] *To explore whether the difference between the strength of these effects was statistically significant, a model was specified in which the effects were constrained to equality; the two nested models were compared using the chi-square difference test. The difference,* $\chi^2_{(df=1)} = 7.44$, *was statistically significant, indicating that the constrained model exhibits significantly worse model fit. Thus, the effect of absorption was significantly stronger than that of mind-wandering.*

compulsive mental rituals. Absorption may possibly be a confounding factor inflating reports of OCD-ADHD comorbidity (i.e., perhaps absorption is diagnosed as ADHD due to certain behavioural similarities). Although further research is needed to support this idea, it is interesting to note that the correlation between OC symptoms and inattention symptoms existed only in individuals diagnosed with OCD but not in those diagnosed with ADHD or in healthy controls, supporting the notion that individuals with OCD have ADHD-like symptoms that may not represent 'true' ADHD (Abramovitch, Dar, *et al.*, 2013). Perhaps these actually represent absorption tendencies, which may manifest in similar ways as does ADHD across various situations. Future studies may benefit from assessing absorption alongside neurocognitive measures in individuals with OC symptoms.

Additionally, another theoretical conceptualization (that, rather than contradict, may complement the executive overload model) suggests a reverse dynamic: Absorptive attentional mechanisms may possibly evoke obsessions and checking behaviour (Soffer-Dudek, 2014). Unfortunately, the direction of causality cannot be deduced from this cross-sectional study. Future research should aim to explicate the mechanisms responsible for the absorption-OC relationship. For example, individuals characterized by absorption may also lack a sense of agency for their behaviour that, in turn, may bring about doubt and uncertainty as to its actuality. Conversely, engaging in repeated ruminating and checking may habituate one's ability to function automatically while awareness is focused elsewhere.

Importantly, mind-wandering and inattention were not completely separate in this study. Smallwood (2013) reviews different conceptualizations of the associations of mind-wandering with attention, executive control, and meta-awareness. For example, it has been suggested that mind-wandering represents a failure of executive control, which enables task-irrelevant internally-generated thought to flourish (McVay & Kane, 2010). However, it has also been suggested that once mind-wandering has been initiated, executive control is needed to ensure the continuity of a self-generated internal associative process (Smallwood, Brown, Baird, & Schooler, 2012). Yet another conceptualization for mind-wandering is the breakdown of meta-awareness (Smallwood & Schooler, 2006), including a reduction in one's ability to regulate consciousness back to a goal-directed state. This construal is reminiscent of absorption, which is also characterized by reduced self-awareness (Butler, 2006). Interestingly, mind-wandering without awareness is associated with greater psychopathology and disruption to functioning compared to mind-wandering while aware of it (Smallwood & Schooler, 2015). However, at least in this study, mind-wandering was distinguishable from absorption, yet not completely distinguishable from ADHD symptoms. The combined 'mind-wandering/distraction' latent construct was significantly associated with OC symptoms. Somewhat relatedly, people were routinely caught thinking about a prior romantic partner (whom they were trying not to think about) before they noticed it themselves; moreover, the more they desired to be with that partner, the less likely they were to spontaneously notice their transgression (Baird, Smallwood, Fishman, Mrazek, & Schooler, 2013). Further study, perhaps relying on thought-sampling, is needed to understand the relationships of executive control, distraction, meta-awareness, and immersion in obsessive rumination.

Three additional noteworthy findings of this study are as follows: (1) OC symptoms were positively associated with distraction, yet inversely related to difficulties in organization, supporting the claim that OCD and ADHD are incompatible on the phenomenological level (Abramovitch, Dar, *et al.*, 2013; Abramovitch *et al.*, 2015).

(2) Impulsivity and hyperactivity constituted separate factors, in accordance with previous literature on ADHD (Sorge *et al.*, 2015). (3) Social/behavioural impulsivity was unrelated to OC symptoms, also replicating previous literature (Fullana *et al.*, 2004; Wu, Clark, & Watson, 2006).

This study has several limitations. First, it is based entirely on self-report questionnaires, thus questioning its validity and possibly causing shared method variance, inflating correlations. Although all of these questionnaires are widely used and well-validated against clinician diagnoses (e.g., OCD) and objective measures (e.g., mind-wandering), any assertion regarding attention should eventually be tested experimentally, as the validation of questionnaires against laboratory measures is imperfect. Importantly, however, any inflation of relations stemming from self-report should have affected all associations equally, so the main findings remain valid. Second, this study is based on a non-clinical, primarily female, undergraduate student sample, raising issues of generalization. Future studies should test these hypotheses on clinical samples. Finally, this study has a cross-sectional design, which does not enable drawing conclusions on causality issues; further research is needed to explore the directional dynamics of attention characteristics (differentiating absorption from distraction) and OC symptoms, perhaps relying on developmental studies or experience-sampling.

Conclusions

This study is compatible with previous studies (Soffer-Dudek, 2014, 2017; Soffer-Dudek *et al.*, 2015) in exhibiting a robust association of absorption with OC symptoms; however, it also expands previous research by demonstrating the specificity of this relation when considering the relation of OC symptoms to distraction and inattention symptoms. Future research should aim to replicate these findings in clinical samples. Indeed, one study on a treatment-seeking sample of patients with OCD demonstrated that dissociative absorption at the beginning of treatment was predictive of treatment non-response (Rufer *et al.*, 2006). Interestingly, in a different study, baseline inattention symptoms were unsuccessful in predicting treatment response for youth with OCD (Guzick *et al.*, 2017). Thus, therapeutic implications should be considered. For example, clients with higher tendencies for absorption may require special training from a clinician to recognize their propensity to become immersed in obsessions (so that they may successfully execute response prevention); perhaps, this may be accomplished by dedicating more time to practice enhancing self-reflection, such as teaching mindfulness techniques. Further research is needed to explore these preliminary ideas.

Finally, this study elucidates a possible reason, in some cases, for the misdiagnosis of ADHD, a diagnosis whose prevalence has been continuously rising in recent decades (Walkup, Stossel, & Rendleman, 2014). Future studies should strive to devise a psychometrically sound screening tool for dissociative absorption, which may aid researchers and clinicians to differentiate inherent inattention from a tendency for dissociative absorption.

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